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In reply cite: 614-3-146  
 RWB/EHG/das  
 18 February 1963

SUBJECT: Contracts AF04(647)-532, AF04(647-829 and AF04(695)-113,  
 AF04(695)-278, Submission of Technical Report  
 WDL-TR2013

TO: Commander  
 Space Systems Division  
 Air Force Systems Command  
 United States Air Force  
 Air Force Unit Post Office  
 Los Angeles 45, California

ATTENTION: Technical Data Center

INFO COPIES: D. Cowart, CSD #3 (1 copy)  
 B. Byrd, Jr., AFSSD/SSOK (w/o enclosure)

REFERENCE:

- (a) Contract AF04(647)-532, Exhibit "B";  
 Contract AF04(647)-829, Exhibit "B";  
 Contract AF04(695)-113, Exhibit "A";  
 Contract AF04(695)-278
- (b) Section II, Paragraphs 2.2, 2.4, and 2.13 of  
 AFBM Exhibit 58-1.
- (c) Paragraph 1.1.1, AFBM Exhibit 60-63; Paragraph  
 1.1.1, Tab A, WDL-TP349-1; Paragraph 1.1.1, Tab A,  
 SSD Exhibit 61-27A.

In accordance with the requirements of references (a),  
 (b), and (c), we are forwarding ten (10) copies of the following  
 document:

<u>Title</u>	<u>No. and Date</u>
Satellite Control Subsystem - Program Progress, Facilities Progress, and Security (1 January - 31 January 1963)	WDL-TR2013 20 February 1963

297016

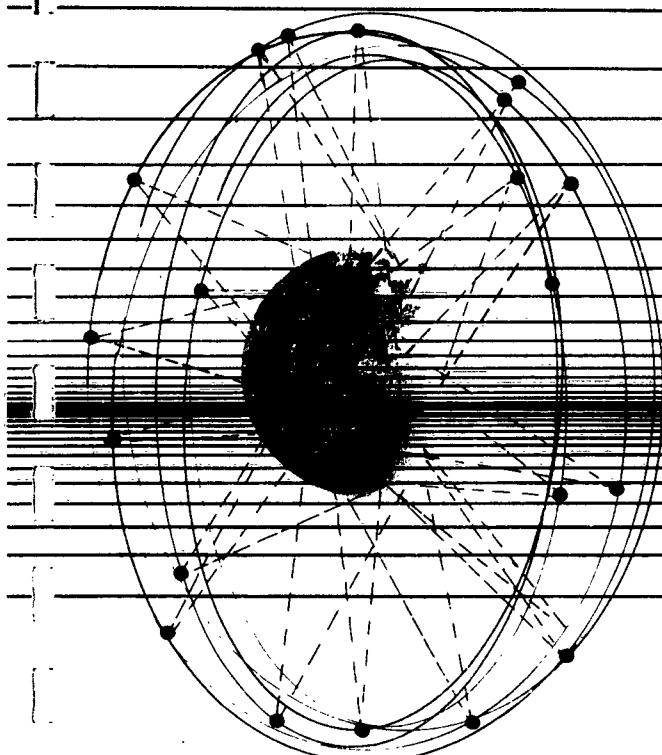
PHILCO

PHILCO CORPORATION  
 Western Development Laboratories

R. W. Boyd  
 Manager, Contracts Management

WDL-TR2013  
20 FEBRUARY 1963

CONTRACT STATUS REPORT



SATELLITE CONTROL SUBSYSTEM  
PROGRAM PROGRESS, FACILITIES PROGRESS,  
AND SECURITY

1 JANUARY - 31 JANUARY 1963

PREPARED FOR:

AIR FORCE SPACE SYSTEMS DIVISION  
AIR FORCE SYSTEMS COMMAND  
UNITED STATES AIR FORCE  
INGLEWOOD, CALIFORNIA

CONTRACT NOS. AF04(647) -532

AF04(647) -829

AF04(695) -113

AF04(695) -278



**PHILCO**  
A SUBSIDIARY OF *Ford Motor Company*.

WESTERN DEVELOPMENT LABORATORIES  
PALO ALTO, CALIFORNIA

SATELLITE CONTROL SUBSYSTEM  
PROGRAM PROGRESS, FACILITIES PROGRESS, AND SECURITY  
1 January - 31 January 1963

Prepared by

PHILCO CORPORATION  
Western Development Laboratories  
Palo Alto, California

Contract Nos. AF04(647)-532, AF04(647)-829  
AF04(695)-113, and AF04(695)-278

Prepared for

SPACE SYSTEMS DIVISION  
AIR FORCE SYSTEMS COMMAND  
UNITED STATES AIR FORCE  
Inglewood, California

PHILCO

WESTERN DEVELOPMENT LABORATORIES

## ABSTRACT

PHILCO WDL-TR2013	UNCLASSIFIED
SATELLITE CONTROL SUBSYSTEM	64 pages
PROGRAM PROGRESS, FACILITIES	AF04(647)-532
PROGRESS, AND SECURITY	AF04(647)-829
1 January - 31 January 1963	AF04(695)-113
20 February 1963	AF04(695)-278

This report discusses SCS progress, including Advanced Studies and Integration activity, for January 1963 under the above contracts. Narrative summaries include ground and vehicle equipment, reliability, human engineering, facilities, and security progress, as well as a notation of significant problem areas which may affect progress and delivery schedules.

Section I contains schedules as well as technical directive and specifications status.

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Section II contains the narrative report.

THIS UNCLASSIFIED ABSTRACT IS DESIGNED FOR RETENTION IN A STANDARD 3-BY-5 CARD-SIZE FILE, IF DESIRED. WHERE THE ABSTRACT COVERS MORE THAN ONE SIDE OF THE CARD, THE ENTIRE RECTANGLE MAY BE CUT OUT AND FOLDED AT THE DOTTED CENTER LINE. (IF THE ABSTRACT IS CLASSIFIED, HOWEVER, IT MUST NOT BE REMOVED FROM THE DOCUMENT IN WHICH IT IS INCLUDED.)

FOREWORD

This document, one in a series of Contract Status Reports on Definitive Contract AF04(647)-532, Exhibit "B". Letter Contract AF04(647)-829, Exhibit "B", Definitive Contract AF04(695)-113, Exhibit "A", and Letter Contract AF04(695)-278, is submitted in accordance with Paragraphs 2.2, 2.4, and 2.13 of AFBM Exhibit 58-1, "Contractor Reports Exhibit", dated 1 November 1959, as revised and amended.

This report is submitted in fulfilling the requirements of Paragraph 1.1.1, AFBM Exhibit 60-63, "Communications and Control Subsystem," dated 10 November 1960; Paragraph 1.1.1, Tab A, WDL-TP349-1, "Program Objectives and Contractor Work Statement for Satellite Control Subsystem," dated 22 February 1961, as revised and amended; and Paragraph 1.1.1, Tab A, SSD Exhibit 61-27A, "Satellite Control Subsystem Work Statement," dated 15 February 1962, as revised and amended.

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A. PROGRAM PROGRESS

**SECTION 1  
SCHEDULES**

SECTION 1  
SCHEDULES

1.1 TECHNICAL DIRECTIVE STATUS

For information concerning the status of active technical directives, see WDL-TR1942, "Satellite Control Subsystem Program Progress, Facilities Progress, and Security, 1 October - 31 October 1962," dated 20 November 1962.

1.2 SPECIFICATION STATUS

The status of active specifications as of 31 January is shown on Tables 1-1 through 1-3, pages 1-2 through 1-7.

1.3 EQUIPMENT SCHEDULES

The equipment schedules reflecting changes through 31 January are shown on pages 1-8 through 1-15.

## 1.2 SPECIFICATION STATUS

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**TABLE I-I**  
**SPECIFICATION STATUS**  
**GROUND EQUIPMENT**

PROGRAM/STATION	SPEC. NO.	AMEND.	TITLE	RELEASE DATE	PRESENT STATUS	REMARKS
698BJ ATS	98-1900-09	1	Radar Tracking System	To SSD 11/27/62	Conditionally Approved thru 1900	
698BJ ATS	98-1901-09	1	Data Handling Equipment	15 Feb 62	SSD Approve 1901 Amend. No. 1	Approved thru 1901;
698BJ ATS	98-1902-09	1	400-MC Doppler System	10 Oct 62	Submitted SSD Approval	Conditionally Approved thru 1902; Amend. 1
698BJ ATS	98-1903-09	2	Timing System	16 Mar 62	Approved (14 June 62)	
698BJ ATS	98-1905-09	1	Control & Display System	15 Feb 62	Approved	
698BJ ATS	98-1906-09	2	Boresight Alignment Equipment	23 Oct 62	SSD Approval	Conditionally Approved thru 1906, Amend. 1
698BJ ATS	98-1907-09	2	200-MC Tracking & Data Acquisition Systems	4 Sep 62	WDL- 1907 Amend. No. 2	Conditionally Approved thru 1907, Amend. 1
698BJ ATS	98-1908-09	2	Communications	4 Sep 62	SSD Approval	Conditionally Approved thru 1908, Amend. 1
		3		31 Oct 62	Awaiting Approval	Letter of Transmittal: 12 Nov. 62;
698BJ ATS	98-1909A-10	2	Annette Tracking Station System Spec.	18 Jun 62	Approved (17 Aug 62)	
698BJ TTS	98-1910A-10	1	Thule Tracking Station System Spec.	15 Jun 62	Approved	
		2		3 Apr 62	SSD Approval	Letter of Transmittal: 12 Apr. 62
		3		7 Jun 62	SSD Approval	Letter of Transmittal: 15 June 62
162 ATS/TTS NHS/VTS RTS/HTS	98-2210A-09	2	Six-Tone 15-Command	26 Sep 62	SSD Approval	1 thru 982210A-09
461 NHS	1508A		VHF Receiving System	5 Dec 61	Approved (4 Apr 62)	
NHS	1509		698BK System	7 Sep 61	Canceled	

**TABLE I-1 (CONT'D)**  
**SPECIFICATION STATUS**  
**GROUND EQUIPMENT**

PROGRAM	STATION	SPEC. NO.	AMEND	TITLE	RELEASE DATE	PRESENT STATUS	REMARKS
461	NHS	1510A		461 System	5 Jun 62	WDL Prepare 1510A, Amend. No. 1	Conditionally Approved
461	NHS	1512A	2	Alignment, Calibration, and Checkout Equipment	29 Jan 62	Approved (11 May 62)	
461	NHS	1513A	1	UHF Command Transmitting System	18 Jul 62	Approved	
461	NHS	1514A	3	UHF Receiving/Recording System	20 Oct 61	AFSSD Approve 1514A Amend. 3	Approved thru 1514A Amend. 1; Amend. 3
461	NHS	1515A	1	T&D Antenna Control System	7 Jun 61	Approved	
461	NHS	1516A	4	Timing and Data Handling Equipment, Ground	19 Apr 62	Approved (17 Aug 62)	
461	NHS	1517A	1	Data Conversion and Control	21 Dec 61	Approved	
461	NHS	1518A		Data Computation Equipment	1 Feb 62	Approved (7 Sept 62)	
461	NHS	1519A		Station Control and Display Equipment	1 Feb 62	WDL Prepare 1519A Amendment No. 1	Approved thru 1519A, Amend & 1519A Disapproved by SETD
461	NHS	1521	4	Angle Tracking System	23 Aug 62	Approved (18 Oct 62)	
461	NHS	1531A		Fly-By Equipment	16 May 61	Approved (3 Apr 62)	
461	NHS	1887A	5	Doppler Tracking and Data Acquisition Sub-System	5 Jun 62 21 Nov 62	To SSD 11/29/62	Approved thru 1887A Amendment No. 4
461	NHS	1887C		Doppler Tracking and Data Acquisition Sub-system			Estimated Submit Date: 17 Feb 63
461	NHS	2001		Doppler Data Converter Subsystems	19 Dec 61	Approved (13 Apr 62)	

TABLE I-I (CONT'D)  
SPECIFICATION STATUS  
GROUND EQUIPMENT

PROGRAM	STATION	SPEC NO.	AMEND	TITLE	RELEASE DATE	PRESENT STATUS	REMARKS
461	FGS	1650A	3	URF/VHF Tracking and Data Acquisition Subsystem	11 Jul 62	Approved	
461	FGS	1653B		Data Computation and Conversion Subsystem	19 Feb 62	Approved	
461	FGS	1654B		Ground Timing and Data Handling Subsystem	21 Dec 61	Approved	
461	FGS	1655A	1	Alignment and Calibration	3 Oct 61	Approved	
461	FGS	1656A	3	Control and Display Subsystem	17 Apr 62	Approved	
461	FGS	1690A	1	FGS System	5 Dec 61	Conditionally Approved thru 1690A, Amend. 1	
461	FGS	1691A	1	Intrastation Communications	3 Nov 61	Approved	
461	VTS	1697	1	Tracking Director/Controller Console	27 Nov 61	Approved 14 June 61	
461	VTS	1882A	3	Doppler Tracking and Data Acquisition Subsystem	5 Jun 62 6 Aug 62	Approved thru 1882A, Amend. 3	
461	VTS	1882C		Doppler Tracking and Data Acquisition Subsystem		Estimated Submittal Date: 14 Feb 63	
461	VTS	2000		Doppler Data Converter	26 Jan 62	Approved 17 Aug 62	
461	VTS	2176		461 VTS System Specification	9 Jul 62		

**TABLE I-2**  
**SPECIFICATION STATUS**  
**VEHICLE EQUIPMENT**

PROGRAM	SPEC NO.	AMEND	TITLE	RELEASE DATE	PRESENT STATUS	REMARKS
461	1493	2 3 4	MX-15	22 Nov 62 22 Nov 62 27 Nov 62	AFSSD Approve 1493, Amend. 2 and 3	Letter of Transmittal: 30 Nov 62 (for Amend. 4)
461	1523B Appendix A Appendix B		RT-5, RT-5A	29 Aug 62 24 Aug. 62	Approve Amend 2	Approved thru 1523B, Letter of Transmittal: 29 Aug 62
461	1524A	2	R-17	13 Dec 62		Letter of Transmittal: 2 Jan 63
461	1525A	1	R-18	22 Nov 62	AFSSD Approve 1524A, Amend. 1	
461	1533A	2	CT-8	28 Nov 62	AFSSD Approve 1525A	
461	1615		0-22	6 Oct 61	AFSSD Approve 1533A, Amend. 2	
461	1625	2	T-25	24 Nov 62	Approved	
461	1669A	1,2, 3,4	WDL-R-43	9 Feb 62	Incorporate changes	Conditional Approval thru Amend. 2
461	1671A		WDL-T-27	19 Jul 62	Approved thru 1669A	
461	1674A		AM-78	4 Oct. 62	Contract change to substitute 1615 for 1671 per SSD TWX SSZCK 16-11-211	In Process
						Approved thru 1674

**TABLE I-3**  
**MULTIPLE SATELLITE AUGMENTATION PROGRAM/CTS**  
**SPECIFICATION STATUS**

SPEC. NO.	AMEND.	TITLE	RELEASE DATE	PRESENT STATUS	REMARKS
98-2043B-09	1	Radar Tracking Subsystem	15 June	Approved through 2043B, Amend. 1	
98-2045C-09	4	FM/FM Telemetry Ground Station		Estimated Submittal: 11 Feb 63	
98-2046B-09	1	Data Handling Subsystem	8 Dec 62	Letter of Transmittal 12 Dec 62	In process
98-2047A-09	3	Timing Subsystem		Awaiting Approval	
98-2048A-09	1	Control & Display Subsystem		Approved through 2048A	To SSD 31 Oct 62
98-2049-09		Checkout Subsystem	25 June	SETD/SSD Approve 98-2049-09	
98-2050-09		Communication Subsystem	7 Jan 63	Letter of Transmittal 24 Jan 63	Awaiting Approval
98-2073-09	1	200 mc Tracking Antenna Sub- system		Approval through 2073	To SSD 31 Oct 62
98-2079-09		Communication Subsystem (Thule)	7 Jan 63	Letter of Transmittal 9 Nov 63	In process
98-2010-10		TS System Specification (for CTS only)		Stop Work, 31 Aug 62	

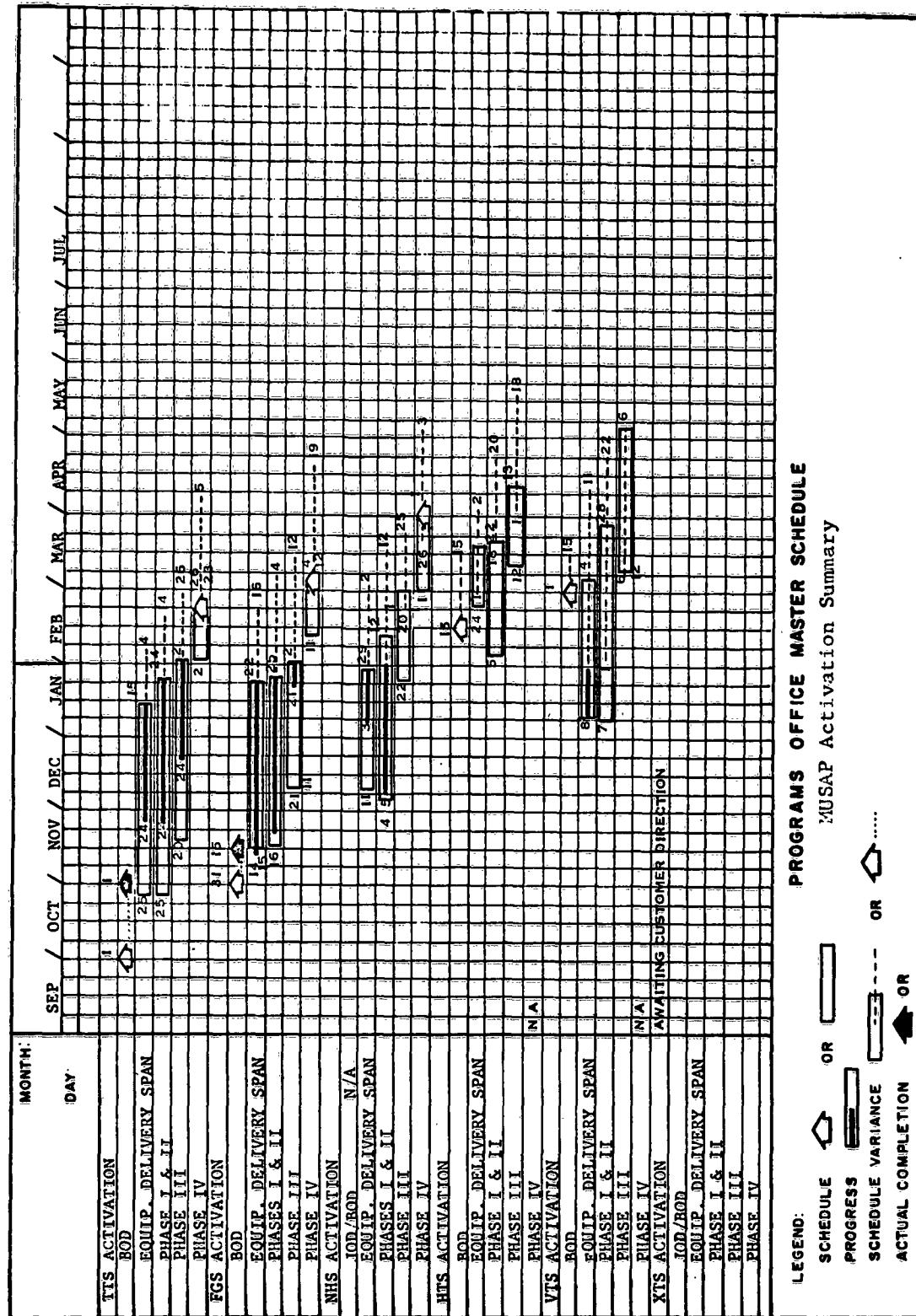
### 1.3 EQUIPMENT SCHEDULES

The ground equipment schedules for Fort Greely Tracking Station (FGS), Vandenberg Tracking Station (VTS), and New Hampshire Tracking Station (NHS) are shown on page 1-9.

Program schedules for MUSAP are shown on pages 1-10 and 1-11

Vehicle equipment schedules are shown on pages 1-12 through 1-15.

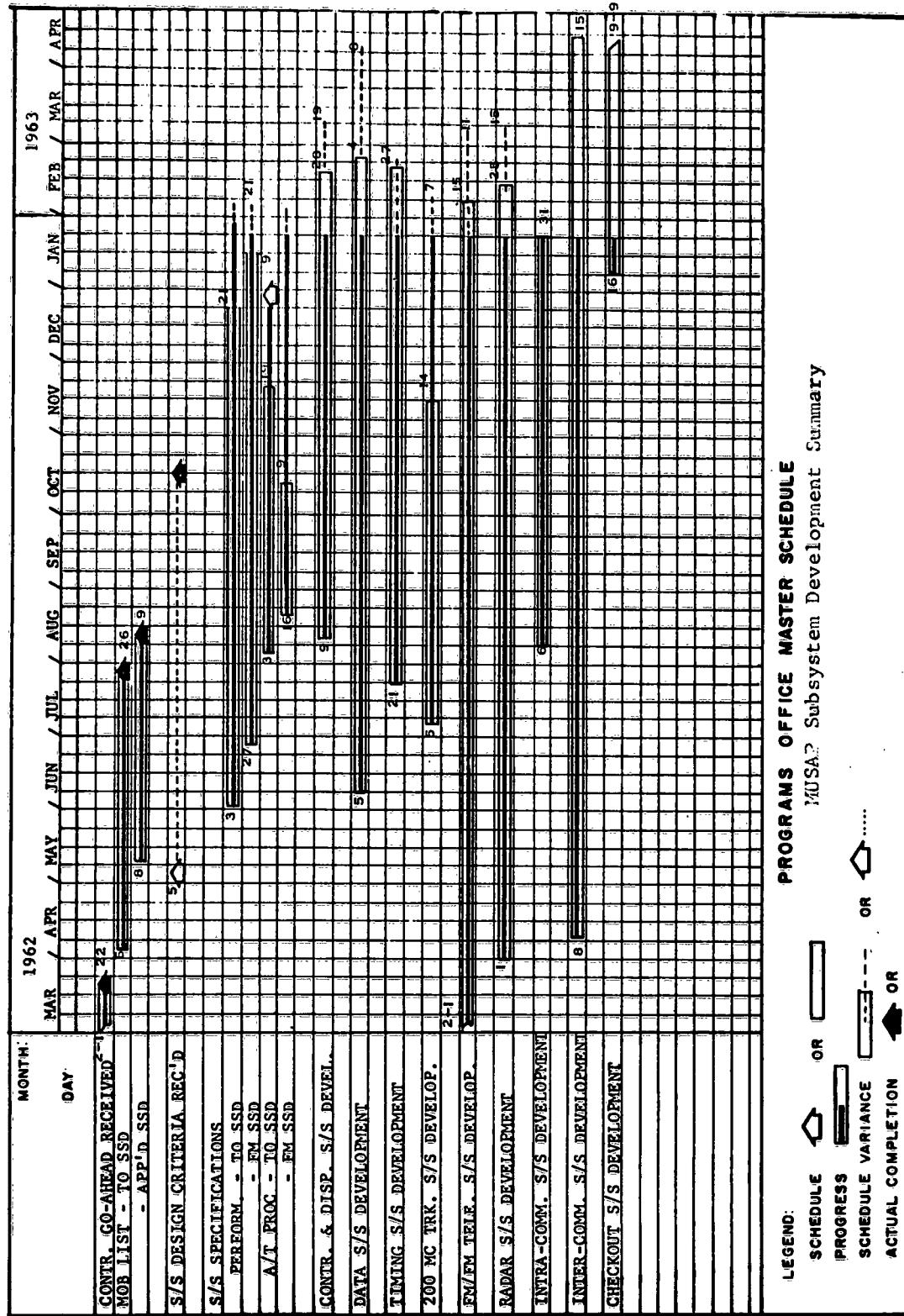
STA.	AUTHORITY & DESCRIPTION	1962										1963				
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
FGS	TD 220 - HEATING & VENTILATING SYSTEM						♦2 COMPLETE				♦3 COMPLETE					ENVIRONMENTAL TEST ECO 3-15-63
	TD 157 - RI ACQUISITION & TRACKING SYSTEM					INTERIM ♦3	♦4 COMPLETE				ROTARY JOINTS COMPLETE					
	ALIGNMENT & CALIBRATION SYSTEM										♦5 COMPLETE					
NHS	CCN 19 - DOPPLER TRACKING SYSTEM							INTERIM COMPLETION			♦6 BRAKES & GEAR BOXES					TO BE COMPLETE 2-4-63
	TD 219 - HEATING & VENTILATING SYSTEM											HELD FOR BORESIGHT TRANSMITTERS DUE 6/5 6-1-63				
	TD 238 - CABLE TRAY INSTALLATION											♦7 DEPENDENT UPON COMPLETION OF TD 157 - R1				
	CCN 12 - VEHICLE SIMULATOR												INTERIM ♦3 COMPLETE			
	TD 156 - RI ACQUISITION & TRACKING SYSTEM												♦8 COMPLETE			
VTS	ALIGNMENT & CALIBRATION SYSTEM												ROTARY JOINTS COMPLETE			
	CCN 19 - DOPPLER TRACKING SYSTEM							INTERIM COMPLETION			♦9 BRAKES & GEAR BOXES COMPLETE					
														HELD FOR BORESIGHT TRANSMITTERS DUE 6/5 6-1-63		
														♦10 DEPENDENT UPON COMPLETION OF TD 156 - R1		



1-10

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**WESTERN DEVELOPMENT LABORATORIES**



1-11

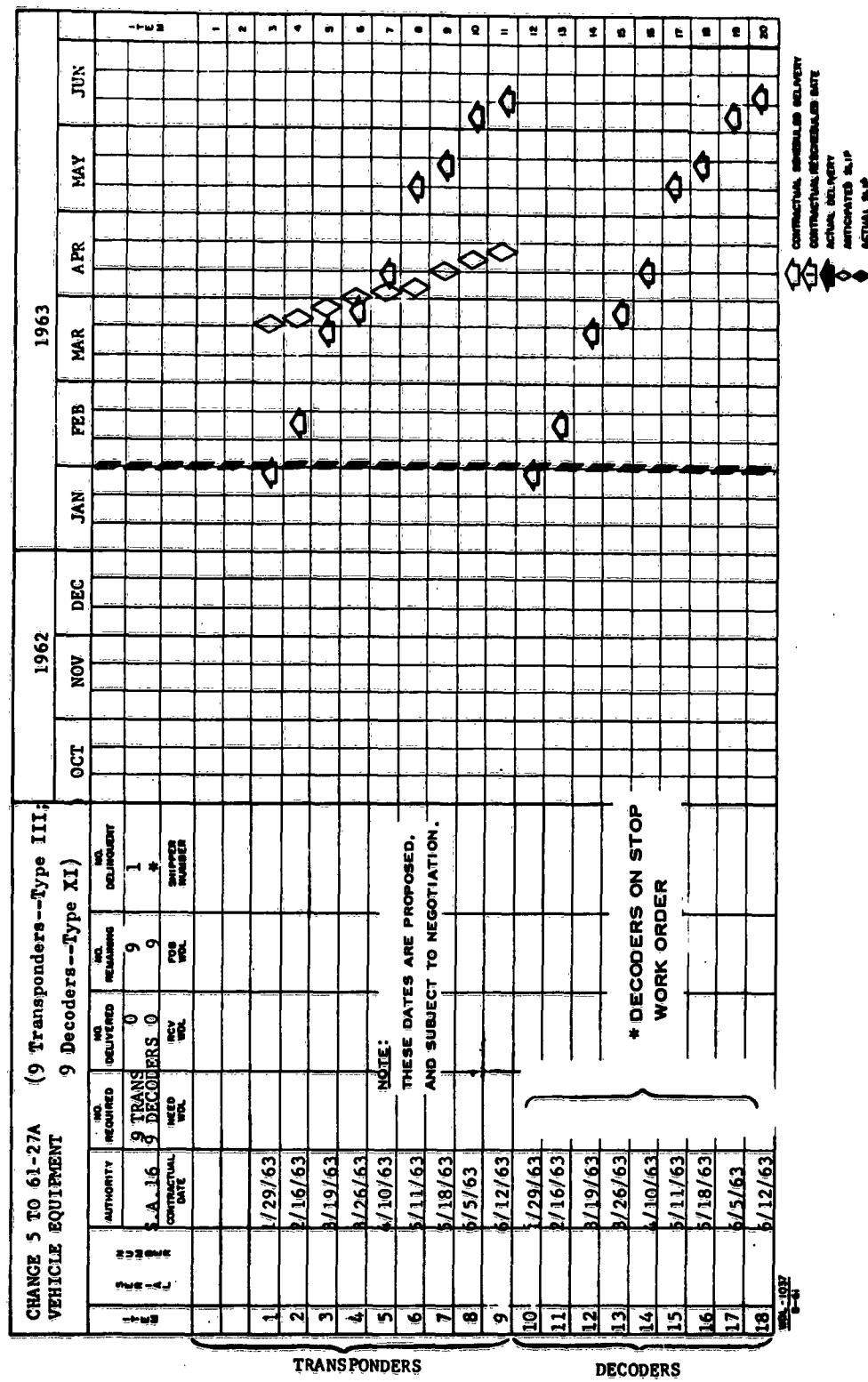
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**WESTERN DEVELOPMENT LABORATORIES**

S-BAND BEACON AND DECODERS  
7 TRANSPONDERS (2 TYPE IIA, 4 TYPE III)  
7 DECODERS (TYPE XI)

ITEM	AUTHORITY	NUMBER	NO. DELIVERED	NO. REMAINING	NO. OUTSTANDING	1963												
						SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	JUL	
1-12	CCN-5 CONTRACTUAL DATE	TRANS 7 DECODERS	3	4	*													
1	586	11/14/62			9/13/62	5794												
2	587	11/21/62			10/30/62	3158												
3	588	12/8/62			12/18/62	9507												
4		12/26/62																
5		1/15/63																
6		1/24/63																
7		2/9/63																
8																		
9																		
10 DECODERS																		
11		11/14/62			1/15/63	3292												
12		11/21/62			1/28/63	3986												
13		12/8/62			1/28/63	3985												
14		12/26/62																
15		1/15/63																
16		1/24/63																
17		2/9/63																
18																		
19																		
20																		

CONTRACTUAL SCHEDULED DELIVERY  
CONTRACTUAL SCHEDULED DATE  
ACTUAL DELIVERY  
ANTICIPATED SHIP  
ACTUAL SHIP

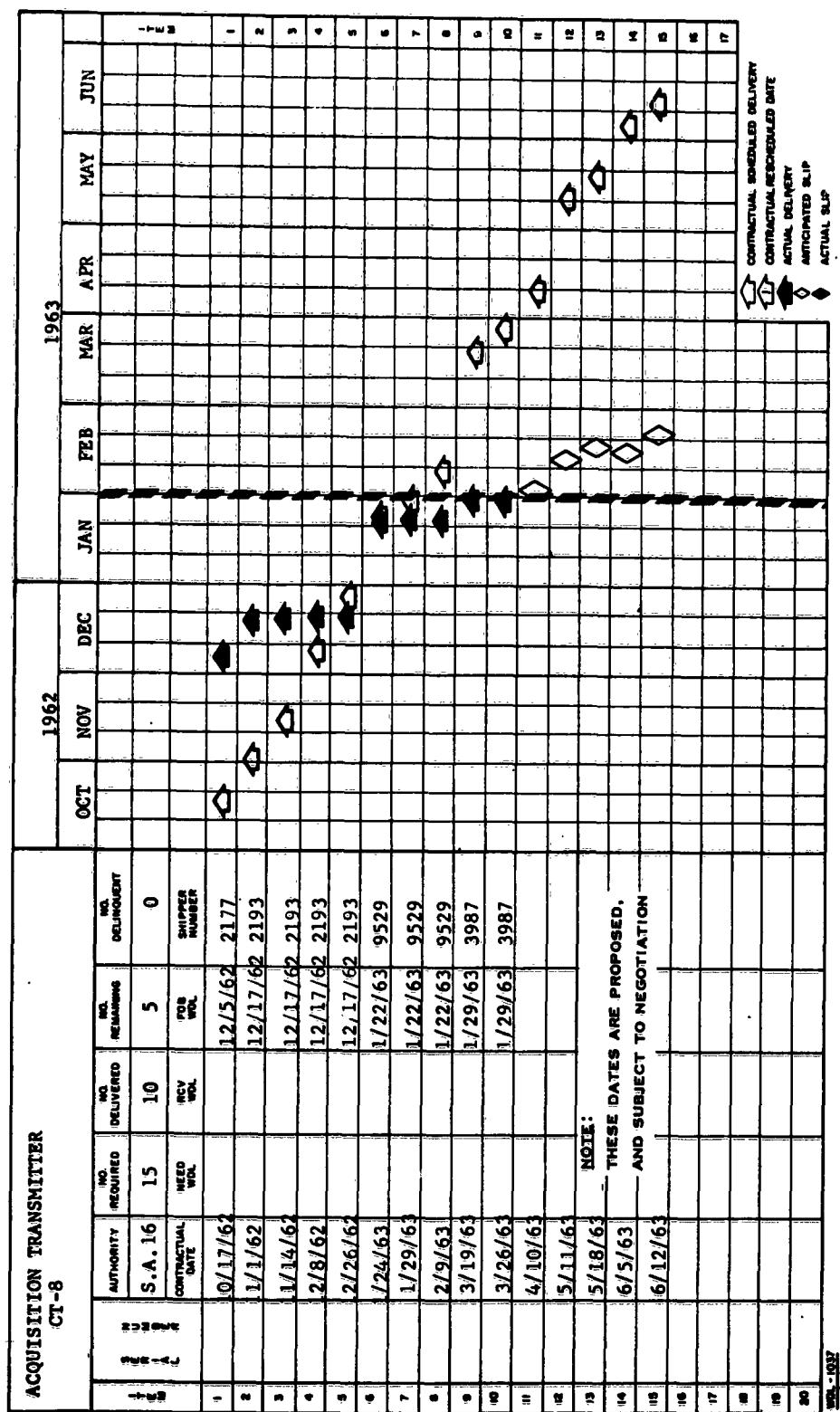


1-13

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**WESTERN DEVELOPMENT LABORATORIES**

\* First Unit Started Qual Test on 8-21-62



1-15

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**WESTERN DEVELOPMENT LABORATORIES**

**SECTION 2**

**NARRATIVE SUMMARY**

**Paragraph 2.1 - Special Programs**

**Paragraph 2.2 - Program 461**

**Paragraph 2.3 - Multiple Satellite Augmentation**

**Paragraph 2.4 - Station Integration**

## 2.1 SPECIAL PROGRAMS

### 2.1.1 System Design and Development

General. For the design test data reduction (DTDR) effort, the noise in ATS 400-mc Doppler track data from previous fly-by tests was found to be nominal, and compares to that obtained from normal satellite passes. The technical report of the propagation effects on Doppler measurement, WDL-TR1993, "Doppler Propagation Study," will be released in February.

The Flight Test Engineering Analysis Report for FTV 2351 was completed and preliminary copies were forwarded to GSE/TD(LMSC). Copies for distribution within Philco WDL are being prepared.

ROM's were submitted for the 14.5-kc tape speed compensation for three existing stations and for five augmented stations. Follow-up action is being taken to reduce the vendor-quoted 150-day procurement span for the tape speed compensation equipment for the existing stations.

Annette Tracking Station. Attempts are being made to obtain recent track data for analysis of Verlort II tracking accuracy.

PTS Calibration at VTS. The survey of the camera sites at VTS was completed and personnel have returned to WDL. Reduction of this data is in process.

A T-39 airplane has been proposed for use as the fly-by airplane for the PTS calibration tests. WDL representatives have examined a T-39 at Edwards AFB and have found it to be acceptable. However, an aircraft of this type will not be available before April. Discussions were held among WDL, Aerospace, and SSD representatives concerning the impact of the April date. The main effect is that the calibration tests will occur during and after VTS augmentation. For the present, planning will continue as outlined in WDL-TR1874A. The antennas to be calibrated remain the TLM-18, Verlort, and T&D.

Program 162. A letter dated 4 January 1963 was forwarded to SSD/ASCO concerning the radar analog code six pulse spacing incompatibility. The Aerospace design criteria analog code six requirements for the Prelorts differ from existing Verlort and beacon requirements. Alternatives to change the Prelort design criteria or to modify the Verlort were presented. Technical direction is expected in the near future.

A 15-command system flight test plan was transmitted to the 6594th ATW for inclusion in the applicable test operations order.

Program 698BK. A preliminary engineering plan for the additional decommutators at NHS and VTS was prepared, and it is anticipated that an ROM will be completed by 18 February.

The engineering plan and ROM's for the GDHE/command interface equipment (CIE) are being re-evaluated to consider an alternate plan using the computer to provide many functions previously planned for the CIE.

Arrangements for the load of a VTS wide-band UHF receiver for engineering tests and evaluation at LMSC have tentatively been completed. It is expected that these tests will start in February and extend for a maximum of 30 days.

The incompatibility between 698BK 15-command system verification requirements and the present ground station design as reported last month still has not been resolved.

MUSAP. Effort was terminated on the Verlort/MUSAP interface plan for HTS and VTS. Inputs were supplied for the MUSAP Phase B-2 program plan for FGS and TTS for the 150-mc and 400-mc subsystems.

Program 417. Follow-up action was continued for the Program 417 receiver modification at VTS and NHS. The modification at both locations is considered satisfactory for program support.

Program 206. The capability of SCF configurations to support Program 206 are being evaluated as requirements are known. Coordination was accomplished with the Program Test Director at the STC regarding MUSAP support.

#### 2.1.2 Ground Equipment (See Figs. 2-1, 2-2, and 2-3)

15-Command Modification. Noise problems in the Type XI command decoders have caused a suspension of delivery schedules for those units required for the ground beacon verification equipment. The amount of schedule slippage is not known at this time, since it depends upon the time required by the vendor to solve the noise problems.

VTS experienced minor 15-command equipment problems, and emergency field engineering support was provided. Operational capability was restored in time to support the latter part of flight operation then in progress.

#### 2.1.3 Vehicle Equipment

S-Band Beacons. The present S-Band beacon effort consists of procurement, test, delivery and coordination for the following contract items:

1. CCN-5 to D/C AF04(695)-113
  - Three WDL-RT-5A transponders
  - Seven Type XI command decoders
  - Five WDL-RT-18 (Type III) transponders  
(four deliverable and one qualification unit).

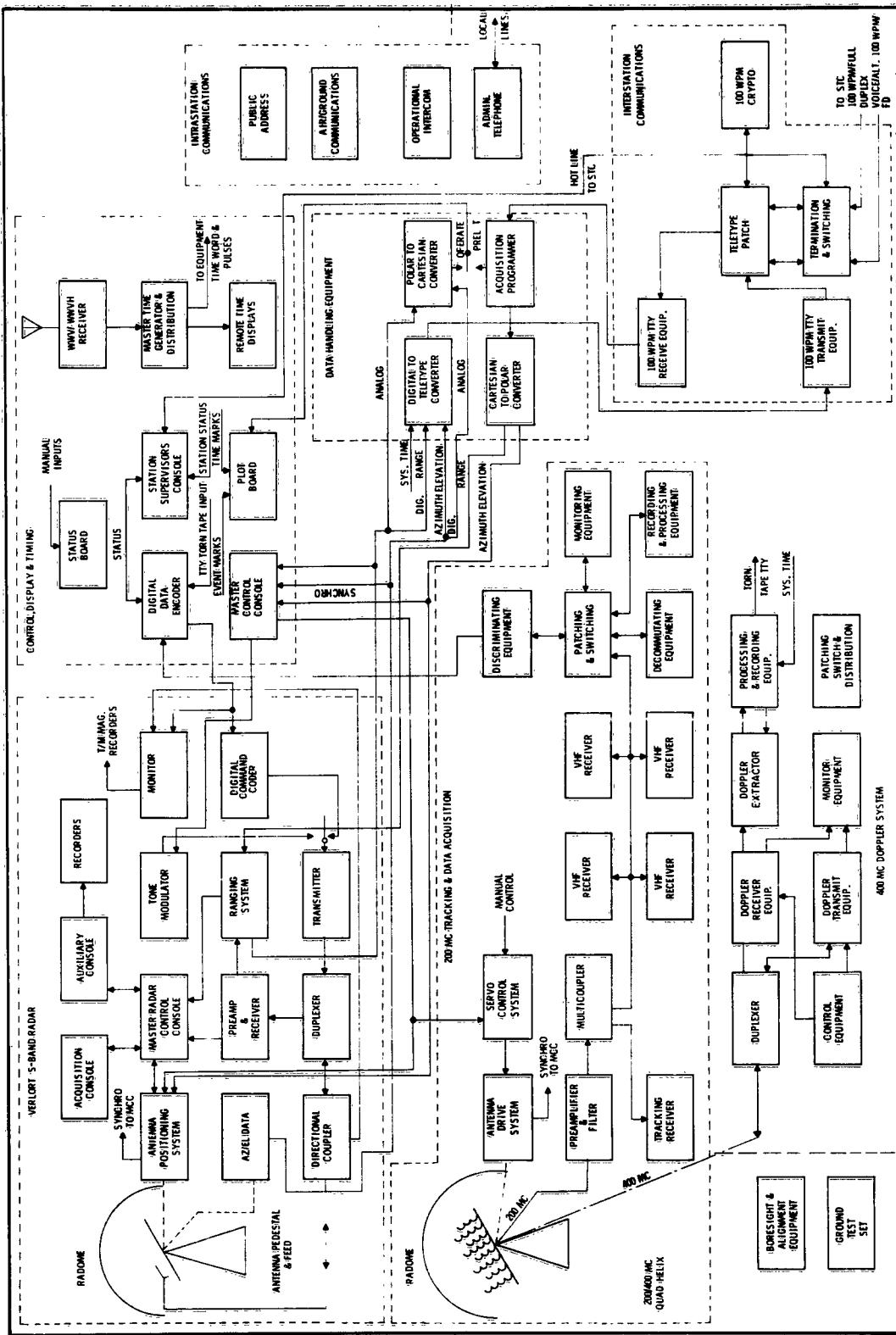
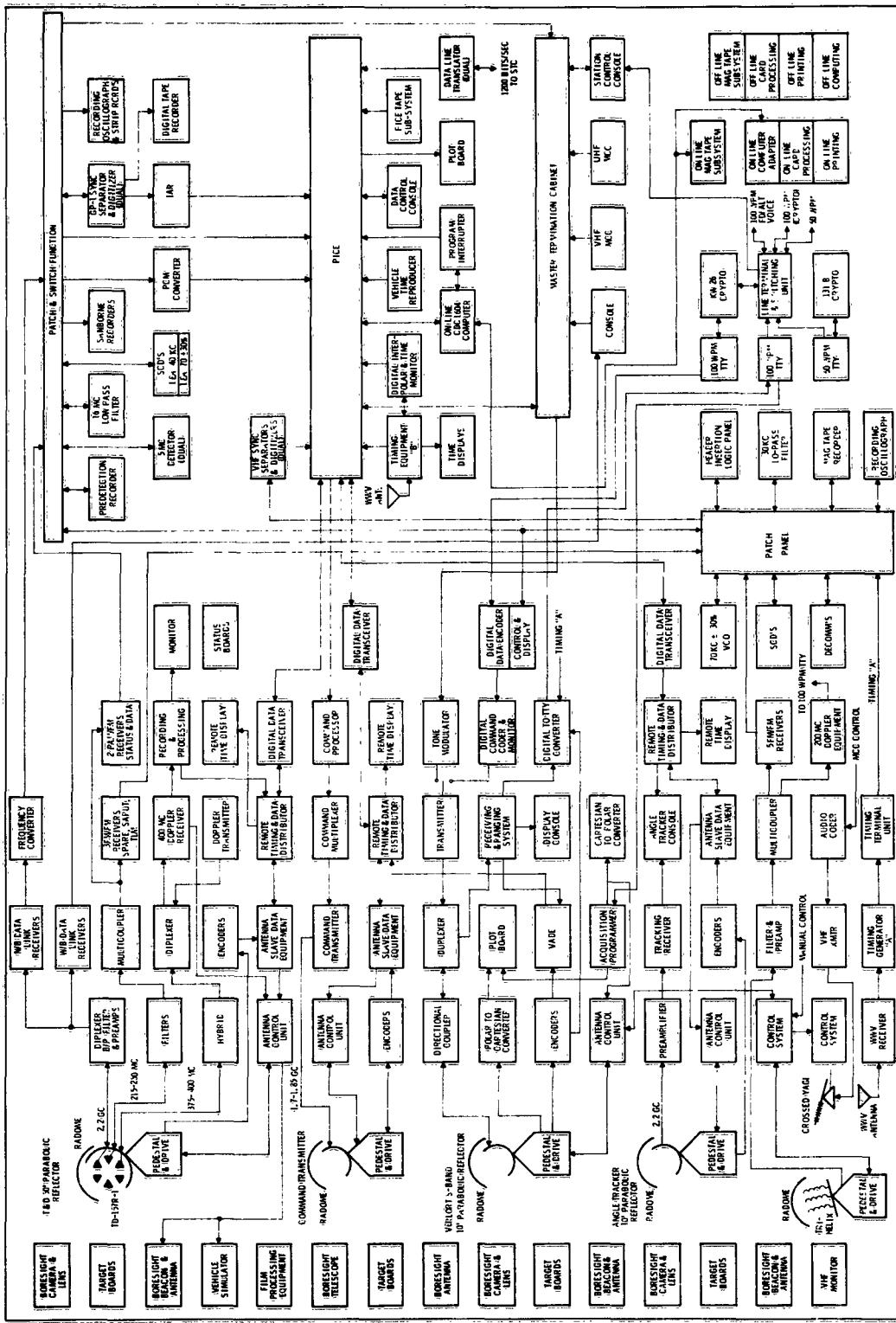


Fig. 2-1 Annette Tracking Station (ATS)

Fig. 2-2 New Hampshire Tracking Station (NHS)



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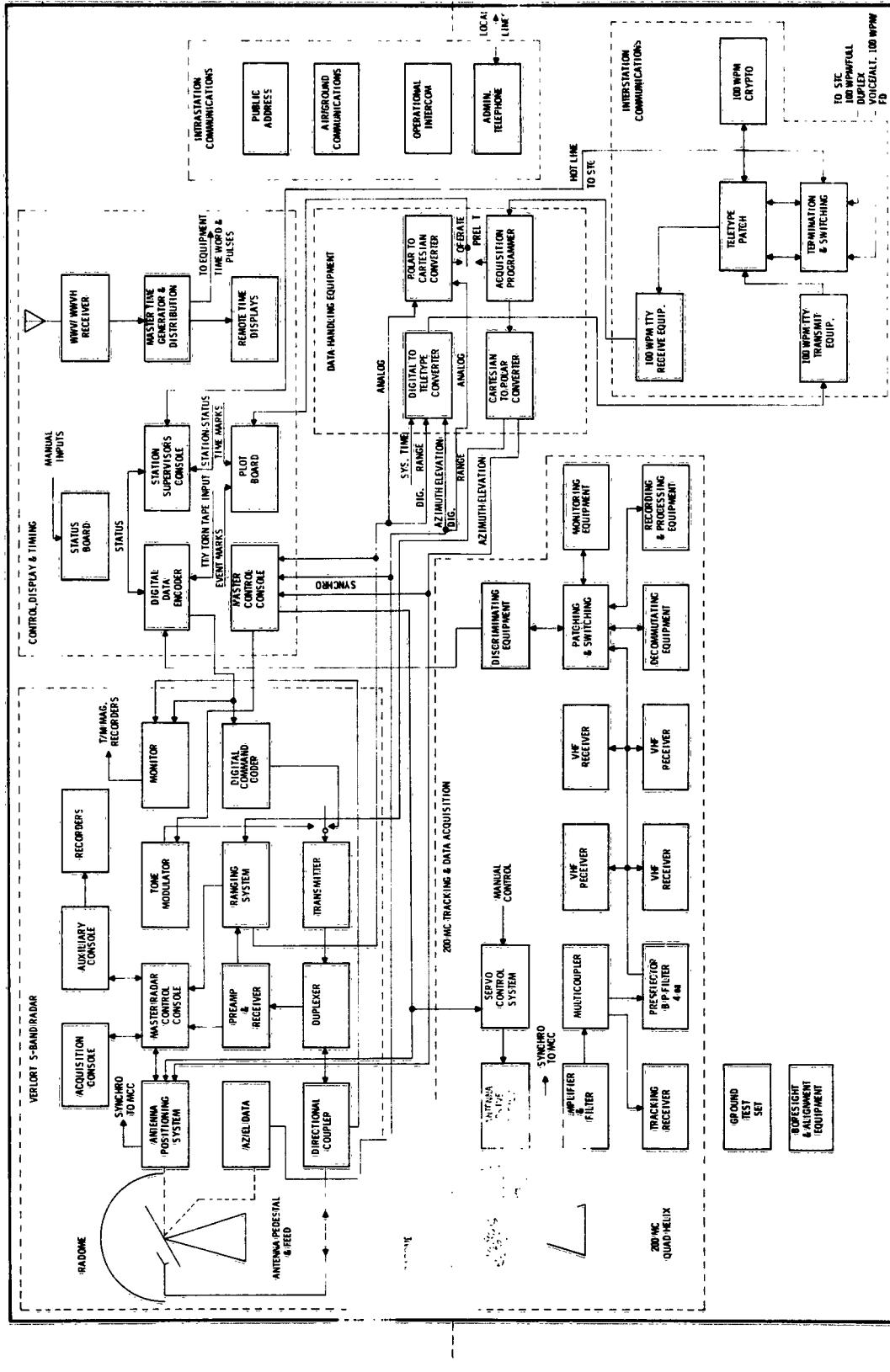


Fig. 2-3 Thule Tracking Station (TTS)

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2. SA-16 to D/C AF04(695)-113

- Nine Type XI command decoders
- Nine WDL-RT-18 (Type III) transponders.

Under (1) above, three mated WDL-RT-5A transponders and Type XI decoders were delivered during the report period. Delivery of the remaining four Type XI decoders has slipped indefinitely as a result of Air Force direction to stop deliveries from AGA until resolution of an LMSC modification. Delivery of the five transponders is slipping due to design difficulties encountered during preshipment testing.

Under (2), delivery of transponders and decoders will slip as a result of the reasons stated above.

Problem Areas. Considerable slippage is anticipated in the delivery dates of systems under CCN-5, and some slippage is anticipated under SA-16. Philco has sent a scheduling specialist to AGA to determine problem areas in AGA scheduling, and all other possible action is being taken to reduce slippage to a minimum. .

2.1.4 Station Design and Planning

Effort was continued on final drawings for the cable tray installations at NHS (TD238), and for the 15-command modification at TTS.

2.1.5 Human Factors

Man-Machine Design. The following technical reports are being prepared for publication:

1. WDL-TR2007, "Human Factors Engineering, Special Programs and Program 461 Final Report."

2. WDL-TR2008, "Human Engineering Description of Instrumentation at NHS for Support of Program 698BJ"

2.1.6 Reliability

General. Reliability evaluations were completed for the radar and FM/FM telemetry subsystems.

A total of 268 trouble and failure reports were received for Program 162 equipment. Of these, 101 were from ATS, 72 from TTS, and 95 from NHS.

Technical Reports. WDL-TR1990 "Reliability Monitoring Points and Quarterly Review Report," dated 11 January 1963, was submitted to SSD.

WDL-TR2001, "Monthly Reliability Failure and Problem Summary, Letter Report for December 1962, "dated 20 January 1963, was delivered to SSD.

2.1.7 Advanced Studies

Doppler Tracking Loop Optimization Study. This effort was completed and the final report, WDL-TR1948, was published 11 January 1963.

During the study, theory was developed and implemented to allow an adaptive optimization of the threshold of a phase-locked loop. An adaptive bandwidth receiver has been built which can vary its bandwidth over a 50-to-1 range by means of electrical control.

Satellite Systems Data Transmission Study. This effort was completed and the final report, WDL-TR1967, was published and distributed 11 January 1963. The report contains the following areas of information:

1. A comparison of PAM-FM and PCM-FM
2. A review of error rates in binary data transmission systems
3. Error rates of FSK using gaussian filter and discriminator
4. Analysis of frequency discriminators.

**2.1.8 Problem Areas**

See Paragraph 2.1.3, "Vehicle Equipment."

## 2.2 PROGRAM 461 NARRATIVE

### 2.2.1 System Design and Development

At SSD's request, HOSPO reviewed a recommendation by LMSC for the providing of 30-mc - 5-mc conversion of UHF data at VTS. WDL concurred in the general approach suggested by LMSC, and made a specific proposal to SSD including estimated cost for the performance of this modification as a field modification.

### 2.2.2 Ground Equipment

This portion of the report is organized by station subsystem; progress for a specific subsystem, or for equipment within that subsystem, is discussed therein (See Figs. 2-4, 2-5 and 2-6).

Tracking Doppler Data Acquisition Subsystem. Redesign of the boresight transmitters for this subsystem is scheduled to be completed on 11 February, and subsequent fabrication will be completed on 3 May.

Site-Oriented Effort. Effort at the sites during the reporting period was as follows:

- NHS. The gear-box and axis-brake modification under TD-157-R1 was begun on 29 January.
- VTS. The TV camera mount is being redesigned to prevent interference with antenna movement.
- FGS - (Acquisition and Tracking Subsystem). Planning continues for accomplishing the acceptance test on the 110-foot radome under the provisions of TD-220. It has been necessary to revise the acceptance test specification, and the test procedure is currently being revised.

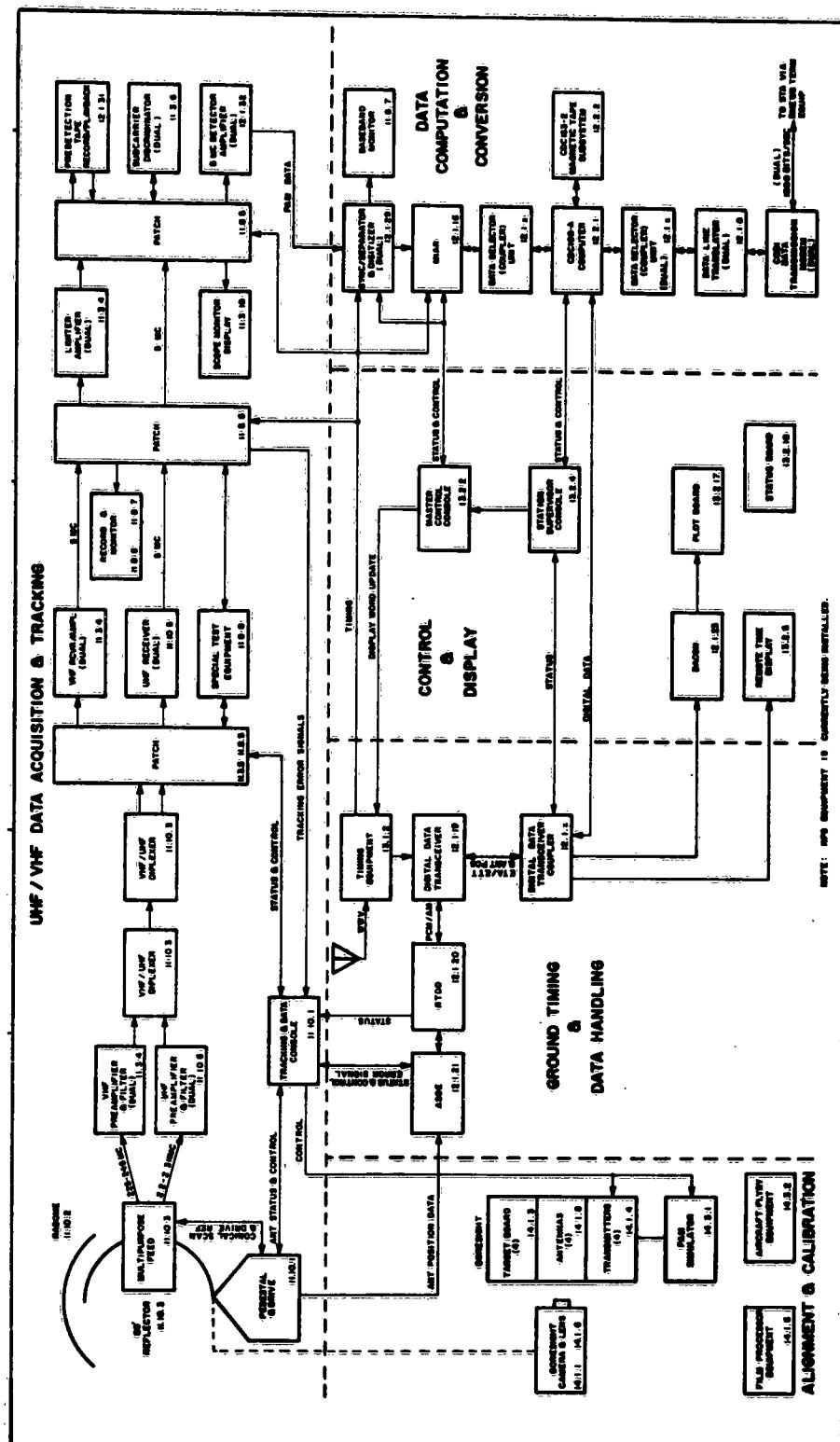


Fig. 2-4 Fort Greely Tracking Station (FGS)

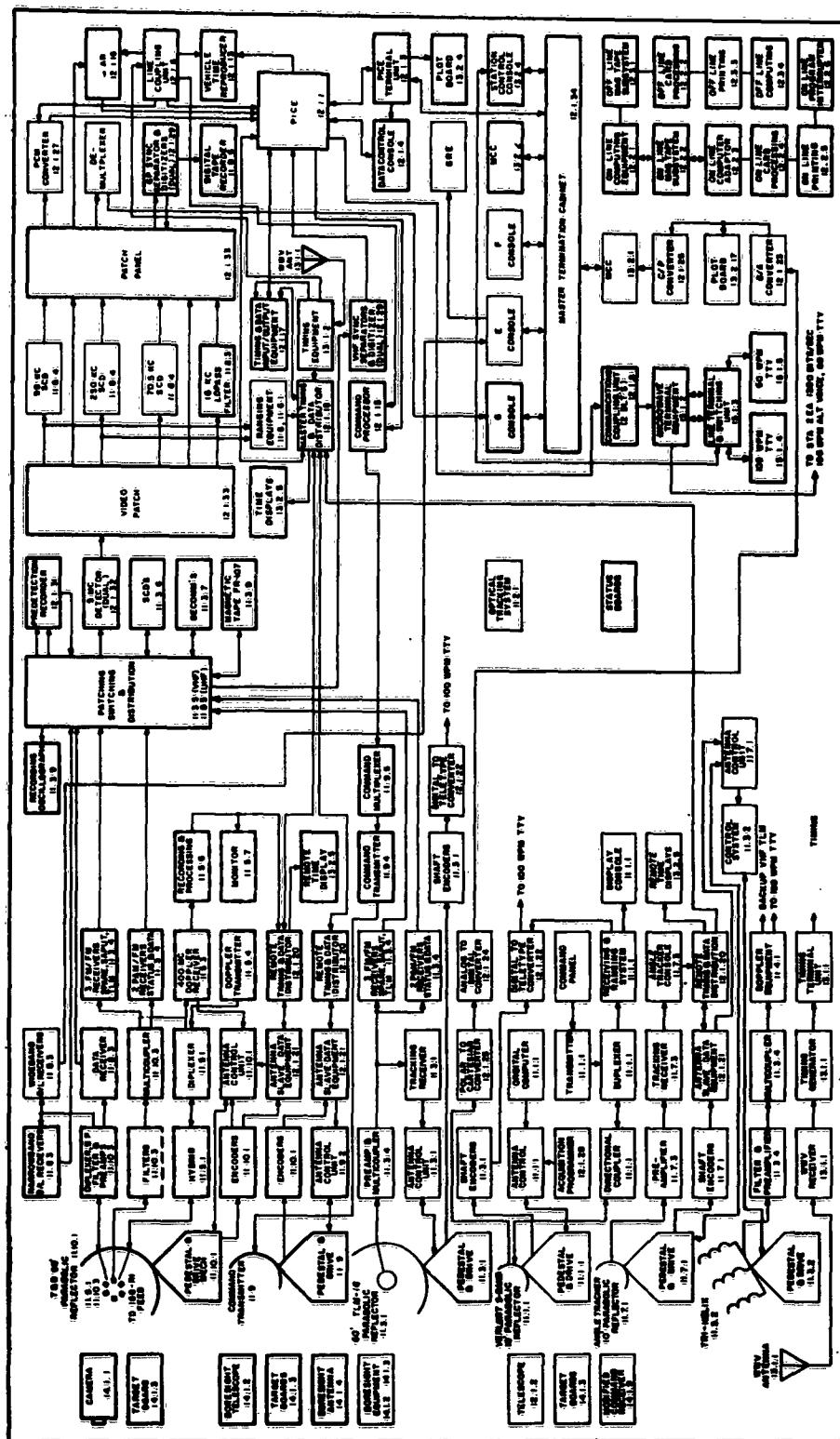


Fig. 2-5 Vandenberg Tracking Station (VTS)

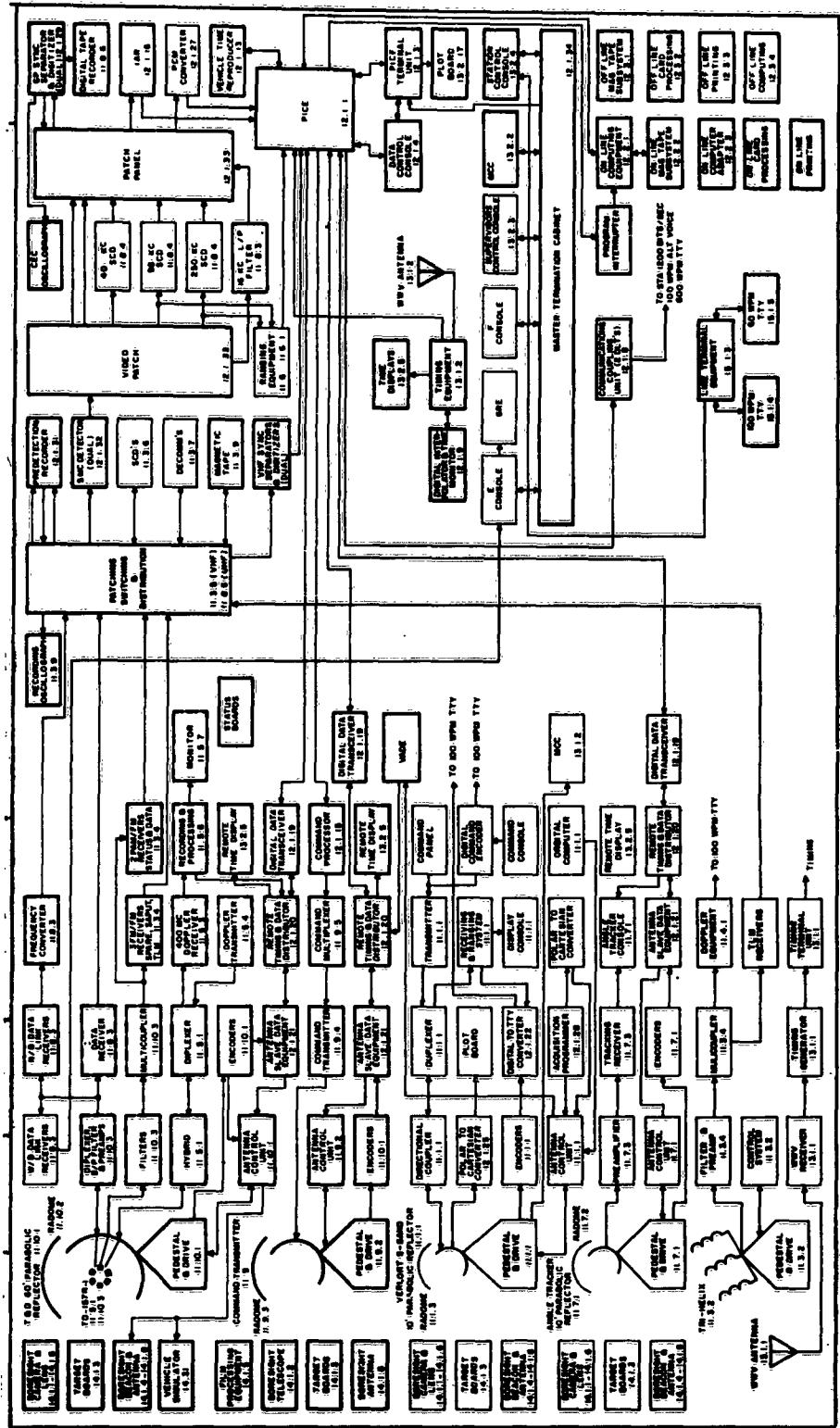


Fig. 2-5 New Boston Tracking and Date Acquisition Annex (NHS)

### 2.2.3 Vehicle Equipment

UHF Command Receiver - WDL-R-43. This task includes the design, development, fabrication, testing, and delivery of two prototype UHF Command Receivers, and the type test qualification of one prototype receiver.

The Type Test Report is now being prepared; all drawings and documentation necessary to reproduce the receiver have been completed.

The handbook, inventory or residuals, final design review, and other tasks incidental to the conclusion of the program are being completed.

See Fig. 2-7 for a photo of the WDL-R-43.

UHF Narrow-Band Data Link Transmitters. This task includes the design and development of WDL-0-22 Solid-State Exciters, and the design, fabrication, testing, and delivery of five AM-78 TWT Power Amplifiers.

a. WDL-0-22 Solid State Exciter. This task, in accordance with TD-164, SA-5, and AFSSD Exhibit 61-27A, includes the design and development of one WDL-0-22 prototype model, and fabrication, test, and delivery of two flight units to be used in conjunction with a TWT power amplifier for an advanced UHF narrow-band data link transmitter.

Qualification testing of one flight unit is in process.

b. WDL-AM-78, TWT Power Amplifier. This task, in accordance with TD-165, SA-5, and AFSSD Exhibit 61-27A, includes the design and development, fabrication, and testing of five WDL-AM-78 TWT Power Amplifiers.

During the reporting period, the third and fourth units were acceptance tested and delivered. Acceptance testing of the fifth unit is now in process. The life test is continuing on the first unit, with a total of 3800 hours accumulated without incident; the qualification test report for this unit is in preparation. See Fig. 2-8 for a photo of the WDL-AM-78.

WDL-CT-8 Acquisition Transmitters. This task, being done under SA-16 to D/C AF04(695)-113, includes fabrication, test, and delivery of 15 WDL-CT-8 Acquisition Transmitters.

Five units were delivered during the reporting period; this makes a total of 10 units which have been delivered.

#### 2.2.4 Station Design and Planning

NHS. Seven days downtime started on 29 January for installation of axis brakes and gear boxes (TD-157-R1). It is estimated that the FF and NF boresight transmitters will be on site by 15 May.

VTS. It is estimated that the FF and NF boresight transmitters will be on site by 15 May. When authority is received, the film processor will be installed.

#### 2.2.5 Human Engineering

WDL-TR2009, "Human Engineering Evaluation of Major Operating Positions at NHS and VTS for Support of Program 461," is now in draft form, and will be published by 1 March. Recommendations were incorporated in the report for modifying the command panel switches at VTS and NHS; these recommendations were made in response to an AFSSD (SSOC) inquiry about the order and logic of the arrangement of the switches.

#### 2.2.6 Reliability

WDL-TR2013

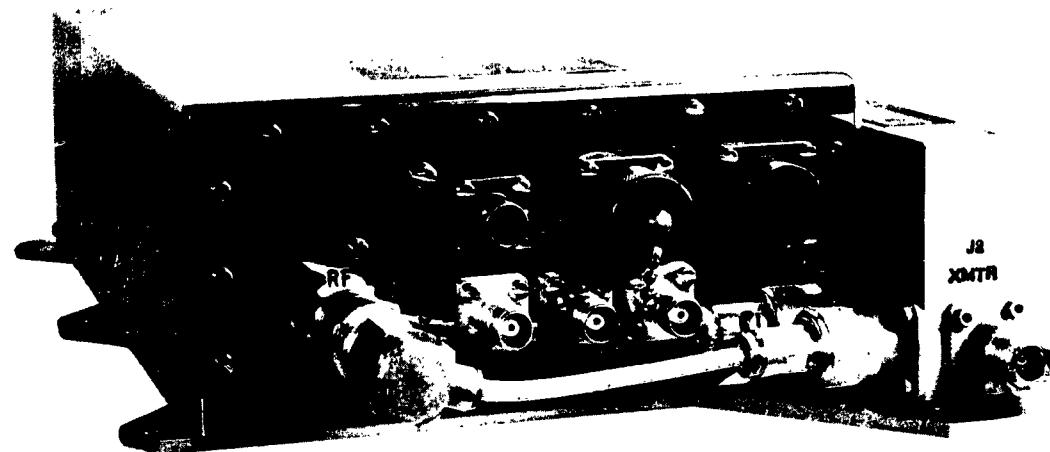


FIG. 2-7 WDL-R-43, UHF COMMAND RECEIVER

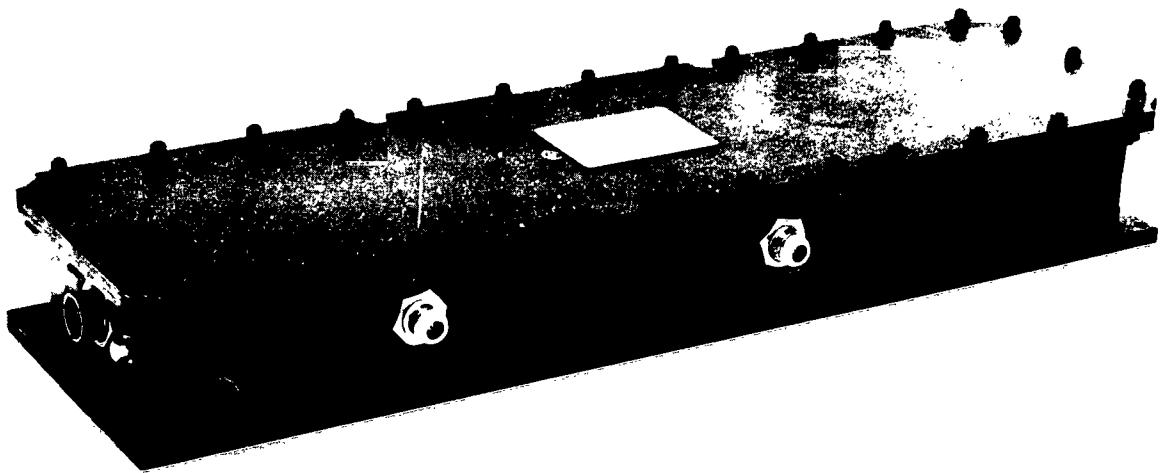


FIG. 2-8 WDL-AM-78, TWT POWER AMPLIFIER

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Technical Reports. During the reporting period, the following report efforts were made:

- a. WDL-TR1946, "Life Test on the WDL-RT-5A Radar Beacon Transponder with Six-Command Command Decoder," is being prepared, and will be published during the next reporting period.
- b. WDL-TR1981, "Life Test of the WDL-R-17 Command Receiver," was published, and the required copies were sent to the Air Force, on 31 January.
- c. WDL-TR1990, "Reliability Monitoring Points and Quarterly Review Report (July through November 1962)," was published, and the required copies were sent to the Air Force, on 11 January.

#### 2.2.7 Advanced Studies

Special Parameter Tracking Simulation Study. This effort is a composite of three previous studies that have been redirected by AFSSD (Advanced Trajectory Analysis, High Altitude Tracking Simulation and Evaluation, and Low Altitude Tracking Simulation and Evaluation). The purpose of the redirected study is to prepare a design tradeoff handbook, using the Co-variance Simulator Program, for error propagation in orbit determination.

Volume I, containing the material derived from the 125 NMI satellite orbit, was published during the previous reporting period; Volume II, which contains the material derived from the 2000 NMI satellite orbit, was published on 17 January; Volume III, which contained a summary of the data from the first two volumes, was published on 31 January.

Doppler Tracking Loop Optimization Study. The purpose of this study is to investigate methods for improving the performance of the phase-locked loop receiver, particularly as a reliable means for locking onto, and determining precisely, the doppler frequency shift of a 2-gc carrier in the presence of noise.

The final report, WDL-TR1948, was published on 10 January.

Interstation Data Transmission Study. The purpose of this study is the evaluation of current interstation data transmission capabilities and limitations, evaluation of applicable coding techniques, and the development of possible systems trade-offs.

The final report will be forwarded to the customer by 1 March.

Ground Terminal Noise Minimization Study. The purpose of this study is to determine the most advantageous techniques to be employed to increase the sensitivity of ground receivers now employed in existing and contemplated telemetry and payload data links.

The final report, WDL-TR1972, was published on 18 January.

Antenna Calibration Study. This study is being undertaken to determine methods of calibrating the 60-foot T&D antenna to obtain tracking accuracies within one milliradian.

The final report, WDL-TR1960, was published on 11 January.

TWT Cross-Modulation Study. The purpose of this study is to determine the cross-modulation parameters of a TWT for satellite use.

The study has been completed, and the final report, WDL-TR1991, was published on 31 January. The report presents the results of a study of cross-modulation effects during simultaneous signal transmission in the newly-developed space vehicular Traveling Wave Tube Transmitter (Type WDL-AM-78).

FGS T&D Antenna Resonant Frequency Study. The purpose of this study is to determine experimentally, and to define analytically, the mechanical dynamic characteristics of the FGS T&D antenna. The resultant mathematical model will be utilized to predict performance, and to analytically determine a means of modifying the antenna to improve its performance.

A preliminary report has been submitted to the customer. This report contains only the significant data gathered from FGS. The analysis of the data will be contained in a subsequent report.

The next phase of the study will involve the refining of the mathematical model of the antenna, based on a greater understanding of this particular antenna acquired in these field tests, and on the experience in analysis and experimental data gained from experience with other antennas which has been acquired since the original analysis of the FGS antenna.

Also, the problem of how components of this antenna could be modified to improve its dynamic performance will be investigated. This will be done by: (1) critical examination and analysis of the test data, and (2) analytical studies in which various parameters in the mathematical model are varied to determine their effect on the antenna dynamic characteristics.

The final report will be forwarded to the customer by 1 March.

#### 2.2.8 Problem Areas

##### Ground Equipment Problem Areas

- NHS. Testing of the r-f transmission line at NHS before and after maintenance indicates that VHF losses have been significantly reduced, while UHF losses were not improved.

Effort is continuing to achieve acceptable operational status.

## 2.3 MULTI-SATELLITE AUGMENTATION PROGRAM

### 2.3.1 Systems Design and Development

Effort continued to review WDL subsystem specifications and procurement specifications, and to coordinate functions with Aerospace, SSD and WDL personnel, in order to monitor the Program's progress and to insure compliance with system requirements.

The system specification for MUSAP, Phase A (WDL-98-2314-10) has been completed and a rough draft forwarded to Aerospace and SSD for comments.

Effort was continued on the MUSAP Phase B-1 implementation plan for New Hampshire Tracking Station. The system functional block diagram was updated to reflect latest design changes.

An implementation plan for MUSAP, Phase B-2, at the Thule and Fort Greely tracking stations is being prepared. This document, WDL-TR2024, will be submitted 18 February.

System functional block diagrams for MUSAP Phase A tracking stations have been reviewed and updated.

An implementation plan for additional decommutators required to support Program 698BK have been completed and coordinated with Special Programs.

### 2.3.2 Radar Subsystem

1. Prelort Radar. The Prelort No. 3 scheduled for NHS completed the acceptance test and was shipped on 3 January. While in transit, the pedestal was damaged. The pedestal was returned to the vendor to determine the damage.

System No. 2 at TTS was also damaged due to the disintegration of the foam dome in severe winds. Although the extent of the damage to the radar pedestal, dish, and scanner could not be determined due to weather conditions, a preliminary survey indicated that it would be necessary to return the units to the subcontractor for repair. The situation is presently being analyzed and it is anticipated that the destinations of the remaining three systems will be changed to minimize the impact on the overall I&C schedule.

System No. 5 is undergoing the acceptance test and will be ready for shipment on 4 March. The acceptance test span for system No. 6 is 18 February through 4 March with an FOB date of 25 March.

2. Prototype Wide-Band RF Components. As a result of a WDL/ASCO review meeting, the vendor was requested to rewrite the wide-band acceptance test procedures. This was accomplished and the new procedure is presently at WDL for review. The vendor has essentially completed procurement for modification, and fabrication of the rigid waveguide pieces is expected to be completed within the first few days in February. The "breadboard" rotary joint was brought to WDL for high power CW and corona noise tests. The wide-band r-f components should be installed in System No. 4 by 22 March.

3. Interference Study. The final engineering report on the interference study received on 18 January is presently being reviewed.
4. Anti-Interference Modification Proposal. As a result of redirection from SSB/Aerospace regarding the scope of the Anti-Interference Modification Proposal, the proposal will only include modification planning for one tracking station. A draft of the engineering portion, Volume I, is being completed.
5. 5-Address Digital Modification. A bill of materials, recommended spare parts lists, and special tool lists were received from the vendor. A WDL acceptance test specification was prepared and delivered to the vendor. A design review was conducted at WDL where a block diagram, the functional description of the modification, hardware requirements, reliability requirements of components and a schedule review were discussed.
6. Boresight Alignment Equipment. Assembly of target board No. 4 has been completed and was received from the vendor. It will be held in storage until the destination has been determined. Target board No. 5 was damaged beyond repair during the assembly process. Completion of target board No. 5 is now scheduled for 13 February with packing to be completed by 15 February. The camera transit case has been completed and is scheduled for shipment on 1 February.
7. Prelort Foam Radome. Maximum effort is being applied to replace the radome destroyed at TTS. At this time, two approaches are being taken to solve this problem. One approach being taken is to use the fiberglass radome presently stored at NHS. The second approach is to ship another foam dome from storage at Long Sault to TTS.

A preliminary analysis of the cause of failure indicates that it may have been due to wind velocities greater than those the radome was designed to withstand, fissures in the material, varying densities in the material, or flying objects striking the radome. It does not appear to have been caused by resonance. A more detailed investigation is taking place to determine the cause of failure.

#### 8. Data Subsystem

- a. Telemetry Data Processor. The first TDP unit completed the acceptance test with the data subsystem on 25 January. Unit No. 2 was installed in a rack with the data subsystem in preparation for the acceptance test. Unit No. 3 has been assembled and is undergoing a preliminary checkout.
- b. Command Logic Equipment. The CLE equipment for site No. 1 completed the Acceptance Test with the data subsystem. Equipment for site No. 2 was mechanically and electronically installed on 25 January in preparation for the acceptance test with the data subsystem. The equipment for sites No. 3 and No. 4 are in functional test and equipment for sites No. 5 and No. 6 are being fabricated and wired.
- c. Cross Connect Panel. Unit No. 2 was assembled and is complete except for the patchcard storage drawer which is due to arrive at WDL on 4 February. Assembly of unit No. 3 is due to be completed 13 February.
- d. Computer Communications Converter. The "CCC Interface Subsystem Acceptance Plan" was released on 30 January. The first CCC unit underwent a computer diagnostic program pre-acceptance test. All program routines were qualified. CCC units No. 2, 3 and 4 were completed and are ready for the pre-acceptance test. The subsystem compatibility test plan for the computer communications converter/auto-sync units/security equipment/modem was prepared and reviewed.

- e. Digital Data Link Equipment. The digital data link equipment for site No. 1 completed the subsystem checkout and acceptance test. The remote digital equipment for site No. 2 is presently undergoing checkout and functional test. The site No. 3 remote digital equipment has started the checkout and functional test.
9. Timing Subsystem. The time converter units for site No. 4 completed checkout, preliminary, and final acceptance tests and were installed in the time generator racks for packaging. TCU units for sites No. 5 and 6 are in the final stages of assembly and wiring.

All the timing indicator panels will be available for delivery on 3 April; however, every attempt will be made to better this date.

The station status control unit is completely designed and fabrication has started. The anticipated delivery for all 14 units is 5 April.

10. Control and Display Subsystem. The acceptance test on the last 3:2 axis converter unit as part of the synchro data link equipment was completed.

Station program boards No. 3 and 4 were shipped on 2 January and 15 January, respectively. Station program boards No. 5 and 6 are expected to be shipped on 20 February and 26 February.

The No. 3 station operators console was shipped to NHS on 8 January. SOC No. 4 was shipped to VTS on 15 January. SOC No. 6 is presently undergoing test and will be shipped in February. Complete modification kits for all six consoles are being prepared.

11. Checkout Subsystem. The subsystem specification is presently being revised prior to submission for SSD/ASCO approval.
12. FM/FM Telemetry Ground Station. Amendment No. 3 to the subsystem specification was released. This amendment deletes the decomm./servo operation requirement for 12 pps and provides for decomm./servo operation at a minimum of 30 pps. Acceptance test procedures were revised to provide testing through a group of line drivers into the galvo outputs to demonstrate a complete "input to output" system operation.

The first FM/FM subsystem was demonstrated to AFQA and Aerospace representatives on 9 January. As an additional feature, WDL demonstrated that ground station reconfiguration could be accomplished in one minute with a well trained crew. It was packed and shipped to TTS on 14 January. The second subsystem also completed the acceptance test and was shipped on 31 January. The third subsystem will start the formal acceptance test on 1 February.

The use of a different type magnetic tape has improved the performance of the recorders by a factor of 2:1 with regard to dropouts, oxide loss and buildup, tape wear and its ability to be used a greater number of times.

13. Communications. The subsystem specification was approved and transmitted to SSD. The acceptance tests at TTS and FGS were completed. Several minor discrepancies were noted during the acceptance tests and they are being corrected.

14. 200-Mc Autotrack Antenna Subsystem. The acceptance test on the second 200 mc subsystem was completed. The array from this subsystem was sent to TTS on 25 January to replace the array which was damaged beyond repair while in shipment. The third array was installed with the second subsystem. After completion of testing this system will be shipped to FGS on 15 February.
15. Diagnostic Computer Program. The diagnostic program design flow chart and coding for the computer communication converter was completed. All diagnostic programs were checked out with the data subsystem with the exception of the digital data link equipment. The checkout pointed out the necessity for some modifications. These were also completed during the month of January. Paper tapes are now available for all diagnostic programs. All of the subprograms will be put on a master magnetic tape. A modified FGS master control program will be provided to call in the desired subprograms..
16. Operational Computer Program. A preliminary Milestone 4 was reviewed with ASCO on 9 January. A final version will be delivered 4 February. Approximately 70 percent of the operational program was completed through computer check-out; completion is estimated for 18 February.

### 2.3.3 Station Design and Planning

#### Installation Design

Equipment Layout Drawings	100% Complete
Material Procurement Lists	99% Complete
Outside Cable Plant Drawings	100% Complete
Power and Grounding Drawings	98% Complete
Cable Tray and Wireway Drawings	95% Complete

Inst. Detail Drawings	98% Complete
Cable Routing Drawings	89% Complete
Cable Block Diagrams	80% Complete
Cable Termination Lists	61% Complete
Cable Cross-Connect List	50% Complete
<u>Facility Design</u>	
Criteria	100% Complete
Engineering Doc. List	100% Complete
Outside Cable Plant Drawings	100% Complete
Boresight Tower Drawings	77% Complete
Equipment Mounting Drawings	70% Complete
Facility Modification Drawings	100% Complete
New Facility Drawings	82% Complete

Room 208, VTS. Preliminary equipment layouts are in process for the arrangement of data handling equipment in Room 208 at VTS to provide standardized computer complex layouts between stations. Final design will not be accomplished until additional floor space is provided and the necessary redesign authorized

Installation and Checkout, Phase I and II

1. TTS Building preparation is nearly complete. The radar tracking subsystem installation was nearly completed when the radome was destroyed during a heavy "Phase III" storm. The reflector and pedestal were damaged as reported in Para.
- 2.3.2. Installation of the CDC computer equipment started in January and is approximately 15 percent complete, having been greatly hampered by phase weather conditions which have resulted in much lost time. The installation of the control and display subsystem equipment (approximately

20 percent complete) and the 200-mc autotrack equipment (approximately 10 percent complete) have also been severely hampered by weather conditions.

2. F G S

Outside cable terminations are approximately 85 percent complete, and cross connections are being installed in the CTC in the CT building. Cable pressurization is proceeding as spiroline cable terminations are installed. Control and display equipment cable terminations are approximately 10 percent complete. The additional wiring information received on site during January will now allow this task to proceed at an accelerated pace. Crypto equipment, power and ground installations were completed. Instrumentation cable installation is approximately 10 percent complete. The S-band radar subsystem has progressed into Phase III. Installation of cabling to other subsystem is in progress (CTC terminations). Installation of the W.E communication cabinets was completed.

3. N H S

The DAP building preparation is approximately 50 percent complete. The Prelort radar pedestal was received on site in damaged condition, and was returned to the vendor. A replacement has been arranged for, and is expected on site approximately 12 February. Outside cable plant verification and checkout is 95 percent complete. The Prelort boresight tower construction was completed.

4. V T S The DAP building preparation and outside cable plant installation is in progress.

5. H T S Installation at HTS will commence 1 March 1963.

NOTE: Studies are underway to determine best possible means of recovering time lost due to weather, equipment damages enroute, and late deliveries in order to meet scheduled completion dates at FGS, NHS and TTS.

#### 2.3.4 Human Factors

Human Engineering. The Human Engineering Quarterly Progress Report (WDL-TR2002) was submitted to SSD. This document reports the status and progress for station equipment that require critical human performance. The basic Phase A Human Engineering Plan (WDL-TR2026) was given preliminary approval but is being slightly revised as requested by SSD. Five copies of this document will be sent to SSD before 1 March 1963. The Human Engineering Design Verification Plan is in process and will be available during the next reporting period. The Human Engineering Acceptance Test Checklist was finalized and will also be published in February as WDL-TR1968.

During the reporting period, the following information was submitted to Aerospace:

- Human engineering design recommendation for MUSAP control and display subsystem/interstation communications subsystem.
- Current releases of "Operators Decision Data Flow Diagrams".

Maintainability. The maintainability test plan for MUSAP was reviewed with personnel subsystem test and evaluation representatives at NHS for on-site personnel planning and scheduling purposes. A rough draft of the tracking station maintainability system evaluation report will be completed during the month of February. The Phase A

maintainability test plan is nearing completion and will be submitted for publication on 5 February. A maintainability design standard is also being prepared which should be completed during February.

#### 2.3.5 Reliability

A comprehensive review of the Prelort, Verlort I, and Verlort II reliability status has been completed. A summary report "Reliability Subsystem Engineering Activities on Prelort Radar Subsystem", was issued on 18 January. This report contains:

- Reliability failure models
- A comparision of achieved reliability (based on field failure data) and allocated goals.
- Discussions of the status of reliability problem area (RPA) investigations.
- Specific recommendations for design improvements.

These reliability recommendations are now being given consideration by the subsystem engineering section.

#### 2.3.6 Problem Areas

Problems have arisen with the following items of ground equipment (for details, see Para. 2.3.2):

- Prelort radar
- Prelort foam radome.

## 2.4 STATION INTEGRATION

### 2.4.1 Installation Integration

Activation Plans. Activation plans NHS-13 (MUSAP Phase A) and NHS-14A (Series III simulator), and Integration Contractor schedule package No. 604 were distributed on 7 January.

Integration Contractor schedule package No. 605 will be delivered during February.

System Analysis. A preliminary test plan for MUSAP Phase IV was completed and submitted to Aerospace and SSD.

The test plan for the SCF performance evaluation study was completed and submitted to Aerospace and SSD.

The test criteria for MUSAP Phase IV at TTS were completed.

Preparation of test criteria for the following is in progress:

- MUSAP Phase IV at NHS
- Phase IV at IOS
- Phase IV testing of Zeke/Zombie/Zorro command modification at NHS.

The system specification for IOS is being prepared.

Station Control. Aerospace was provided equipment layout drawings for all MUSAP Phase A stations.

A plan for the correction of T & D antenna feed losses at NHS was submitted to SSD/Aerospace. This task will commence concurrent

with the effort to install the new gear box and axis brakes on 29 January, to be completed 4 February.

Coordination was accomplished with SSD and LMSC on the I&C of the Zeke, Zorro, Zombie command system at NHS. Phase IV completion is scheduled for 14 February.

The inadequate power problem at TTS during MUSAP Phases IV and V was discussed, and a utility supply will be provided.

Coordination was accomplished with LMSC on equipment location and delivery for MUSAP and Program 823 at VTS and HTS.

The VTS PICE air conditioning problem was discussed with LMSC and Aerospace. SSD direction was requested regarding the modification of the translation unit cabinet by a subcontract.

Minor Modification Management. A summary of the status of minor modifications is as follows:

1. Total active minor modifications	305
2. Modifications under engineering evaluation	127
3. Modifications being implemented	122
4. Modification kits shipped, but not complete; i.e., no completion/validation report.	56

Proposal Activity. Work was initiated to propose an additional 60-point decommutation capability at NHS. The completion deadline is 20 February.

### 2.4.2 Station Operations

Station Personnel. A breakdown of present station strength versus AFSSD Exhibit "C" authorization is as follows:

	ATS	VTS	NHS	FGS	TTS
Authorized Totals	40	88	168	46	81
Assigned Totals	37	88	149	22	71

The phase-out plan at VTS is designed to provide the additional personnel for NHS and FGS. It will also provide for cadre personnel, when required, at IOS.

### Station Technical Status.

1. Annette Tracking Station. Corrective action was taken to resolve all marginal operational conditions outlined during depot maintenance inspection in November. The Verlort angle system inspection, which was deferred due to operational commitments, is due for completion prior to 1 February 1963.

2. Thule Tracking Station. Depot maintenance inspection was completed during January; minor deficiencies noted are being corrected.

3. New Hampshire Station. Efforts are being expended to perform as much of needed hydraulic overhaul in the D/R area as is possible during downtime for installation of axis brake and gear box and rehabilitation of r-f lines.

The depot maintenance survey of the VHF equipment was conducted during the period 14-18 January. A formal report is in process.

A formal report covering the depot maintenance survey of the UHF system equipment performed in December 1962 was received. Action is being initiated to resolve deficiencies noted.

4. Vandenberg Tracking Station. A failure of an interlock circuit component in the UHF feed assembly of the T&D antenna resulted in failure to support an assigned mission.

Additional Depot Maintenance activity included:

- Repair, cleaning and testing of D/R hydraulic filters
- Repair of a narrow-band data link transmitter and conversion to operation on an unclassified frequency.

#### 2.4.3 Logistics

##### Program 461

###### 1. Tables of Equipment and Inventory List

a. VTS: Total line items: 7500 (includes 3788 PICE).

Final release date 15 March 1963.

b. FGS: Completed; Final release date 15 February 1963.

c. NHS: Total line items: 8063 (includes 1805 GPL items which are being written). Final release date 15 March 1963.

2. Indented Data List

a. VTS: 226 chassis-level items completed out of 650 total.

b. NHS: 148 chassis-level items completed out of 980 total.

3. Spares Status

	Line Items Released for <u>Procurement</u>	Line Items Procured	Delivered on- Site	Delivered to <u>Central Supply</u>
FGS	Effort suspended due to Stop Work Order.			
VTS-CCN 5	1,217	1,115	917	19
NHS-CCN 6	792	684	533	

Special Programs1. Tables of Equipment and Inventory List

a. ATS. Final tab-run issue: 2100 prime equipment line items completed out of 2100 total. Final release date 22 February 1963.

b. TTS. Final tab-run issue: 1460 prime equipment line items completed out of 1460 total. Final release date 15 February 1963.

2. Indentured Data List

a. ATS. Estimated completion date 15 February 1963.

b. TTS. Estimated completion date 28 February 1963.

3. Spares Status

	<u>Line Items Released for Procurement</u>	<u>Line Items Procured</u>	<u>Delivered On Site</u>	<u>Delivered to Central Supply</u>
ATS	8,361	8,248	6,884	535
TTS	7,352	7,200	6,832	366
ATS-CCN 2	446	385	216	0
TTS-CCN 2	446	388	218	0

NHS-CCN 2	446	405 (165)*	248	0
VTS-CCN 2	457	420 (242)*	286	0
HTS-CCN 2	457	416 (242)*	283	0
KTS-CCN 2	461	432 (242)*	297	0
C/S-CCN 2	3	3	N/A	1

\* Line items to be provided by AF or LMSC & considered to be delivered.

#### Multi-Satellite Augmentation Program

##### 1. Tables of Equipment and Inventory List

a. FM/FM Subsystem: 613 prime equipment line items completed in intermediate tab-run phase out of 613 known total.

b. Timing Subsystem: 233 prime equipment line items completed out of 233 known total.

c. Prelort Subsystem: 154 prime equipment line items completed in intermediate tab-run phase out of 154 known total.

d. Data Handling Subsystem: 802 prime equipment line items completed in preliminary tab-run phase out of 1460 known

total.

e. Communications Subsystem: 41 prime equipment line items completed in preliminary tab-run phase, and 4 prime equipment line items completed in intermediate tab-run phase, out of 45 known total.

f. 200-Mc Tracker Subsystem: 45 prime equipment line items completed in preliminary tab-run phase out of 45 known total.

g. Control and Display Subsystem: 57 prime equipment line items completed in preliminary tab-run phase out of 57 known total.

h. Support Equipment Intermediate Tab-run: 318 support equipment line items completed out of 318 total. Manual decks complete on all stations and now being prepared for keypunch.

2. Indentured Data List

a. TTS: 191 chassis-level items completed out of 408 known total.

3. Spares Status

	<u>Line Items Released for Procurement</u>	<u>Line Items Procured</u>	<u>Delivered On- Site</u>	<u>Delivered to Central Supply</u>
XTS	2,172	1,526	0	803
FGS	2,362	2,203	1,060	0
VTS	2,193	1,909 (1,215)*	1,215	0
HTS	2,179	1,941 (1,217)*	1,217	0
NHS	1,576	1,191 ( 493)*	715	0
TTS	2,285	1,897	1,005	0
C/S	675	514	0	371

\*Line items to be provided by LMSC or AF and considered to be delivered.

#### 2.4.4 Personnel Subsystem Development

Personnel Planning and Procedures. The FGS PPI report for MUSAP, Phase A, has been completed and is being reviewed.

The NHS PPI report, covering the existing station plus MUSAP Phase A equipment, was transmitted to SSD on 28 January 1963.

The Philco WDL contribution to the VTS PPI report is in process.

Preparation of procedures for MUSAP Phase A equipment

installation and checkout, operation, and preventive maintenance are proceeding on schedule.

Technical Training. Seven MUSAP Phase A training courses were initiated and three were completed during the report period. Twenty-one Air Force and 51 contractor personnel were in attendance.

Validation of student field training exercises (FTX's) was resumed in which 11 exercises were validated. This effort is 74 percent complete.

Technical Manuals. Preliminary manuals containing organizational-level maintenance on the MUSAP Phase A Prelort radar, 200-mc auto-track antenna, timing subsystem, and control and display subsystem were completed. These manuals are now being reviewed and validated. The four remaining preliminary organizational manuals (FM/FM telemetry, data handling, interstation communication, and intrastation communication subsystems) are nearing completion for on-site delivery.

Thirteen preliminary manuals containing field-level maintenance on MUSAP Phase A equipment were completed and are currently undergoing review.

Of the 83 vendor/subcontractor manuals procured for MUSAP Phase A 72 have been received in final form, 10 have been received

in preliminary form, and four are still due. The four outstanding manuals are scheduled for delivery in February.

System Exercise and Evaluation. The plan for the development of readiness determination methods was approved by 6594th ATW personnel at a meeting on 10 January 1963. Plans for the integration of field and home office efforts in the development of these methods over the next three months were presented and approved by NHS military personnel on 29 January 1963.

The study of methods of using computer recording and printout capabilities to automate the process of readiness determination for MUSAP Phase A equipment is being completed.

2.4.5 Problem Areas. For problem areas see Para. 2.4.1, "Station Control," Paragraphs two, four, and six; and Para. 2.4.2, "Station Operations," Para. 4.

B. FACILITIES PROGRESS

Negative Report

C. SECURITY

Negative Report

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